LECTURE NOTE ON ENTOMOLOGY

SUBJECT :

Control and Eradication of Vector

INTRODUCTION

Objectives

- ☒ **Decrease/suppress vector population, up to an insignificant level in term of epidemiology and spread of disease**
- ☒ **Avoid/minimize the frequency of contact between vector and man**

Terminology

- ☒ **eradication (*pemberantasan*)**
- ☒ **control (*pengendalian*)**

ERADICATION AND CONTROL OF ARTHROPOD VECTOR

INTRODUCTION

- Previously the term eradication was commonly used by WHO for programs to eliminate whole population of insect vector from an area. Currently the term control is more popular as it is now realized that insects cannot be entirely wiped out, only suppressed
- The objective is to control the insect population to a level which could not harm the human health




Aedes aegypti

Control of *Aedes* Mosquito

- ***Aedes*** acts as mosquito vector of many diseases *i.e. Dengue Hemorrhagic Fever, Yellow Fever, Chikungunya, and Japanese Encephalitis.*



Two methods of Vector control

- ☒ **Natural Control**
- ☒ **Artificial/Applied Control**

Natural control

- ☒ **In Natural control, the decrease in vector population is not caused by human effort but due to ecological influence of :**
  - **Existing natural barrier *e.g.* mountains, ocean, and rivers which prevents movement of vector**
  - **Seasonal changes : hot and cold weather, strong wind, rain density which influence growth and development of insects**
  - **Natural predators of insects: birds, frogs, cicak lizard**

Natural control

- The natural control methods by nature influences the food supply and the breeding sites and therefore limits the amount of eggs hatching and the adults from aging

Artificial/Man-made control

- ☒control of vector population using various efforts and methods :
  - ❶control of the environment
  - ❷Chemical Control
  - ❸Mechanical control
  - ❹Physical Control
  - ❺Bioligical Control
  - ❻Genetic Control
  - ❼Legal Control

Man-made control

Controlling the Environment

- Two methods are commonly used to control the environmental habitat of insects :
  1. Environmental modification: changing the physical condition of the environment to prevent vector breeding
  2. Environmental Manipulation: cleaning, improving and maintaining existing physical/ environmental condition to prevent vector resting and breeding

Controlling the Environmental Habitat

- **Enviromental Modification :**
  - **Controlling the flow of irrigation system, removing stagnant waters**
  - **Cleaning of marshlands where mosquito breeds**
  - **Landfill : burial of garbage and trash**

Environmental Manipulation :

- **Prevents water plants from growing on lake fronts (eceng gondok, algae and moss) to avoid breeding places for *Anopheles sundaicus***
- **Modify and control water salinity of brackish water in marshes by adding river water to lower salinity and increase the outflow to prevent breeding of brackish water breeder like *Anopheles subpictus, Anopheles sundaicus***

  - **Removal of waterplants e.g. *eichornia* to provide direct sunlight and prevent *Mansonia* larva from resting under the shade**
  - **Maintain flow of water and prevent stagnant water used for breeding site of *Culex sp.***

Artificial control

1. Chemical Control

- **Based on the effect of its working mechanism, chemical insecticides can be divided into two groups :**
  1. **Insecticides which leave active residue effective for months when sprayed on the wall are called insecticide with Residual Effect (DDT, dieldrine, etc)**
  2. **Insecticides active only instantly and rapidly degraded are called Insecticides with Knock Down Effect (Baygon, Raid, Fumakila,etc)**

Artificial control

1. Chemical Control

- Chemicals are used for two purposes :
  1. **To kill** the insect : insecticides (cidal = eradicate, kill). Sometime the term pesticide is used in place of insecticide (pest = destructive or nuisance). Based on its target insects, pesticides may be called ovicide, larvicide, adulticide or imagocide
  2. **To prevent** insect from attacking, called insect repellent (to repel = to drive away, to ward off)

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The most common scene



Artificial control

1. Chemical Control

- Example of the use of chemical as insect control :
  - Apply thin film of used diesel oil or kerosene on water surface (marshy swamps and water puddle) where larvae breeds, preventing larvae from surfacing and getting oxygen from the air
  - Apply larvicide such as powder of Paris Green or abate (temephos) to water containers
  - Apply herbicides to kill water plants where larvae hides from direct sunlight
  - Apply spraying and thermal fogging using residual types of insecticides to kill adult mosquitoes

Artificial control

2. Mechanical Control

- Use of mechanical mean to directly kill, prevent, or trap the insect :
  - Use of bed nets or mosquito screen on door and windows
  - Use of fly swatter
  - Use of fly traps

3. Physical Control

- The use of physical means of control :
  - Temperature : above 60^{0} C or below freezing point will kill insect
  - Artificial wind screen installed above the entrance door of restaurants and hotels
  - Yellow colored lights prevent insect from approaching

SUITABLE BREEDING SITES FOR ANOPHELES MOSQUITOES



4. Biological Control

- The utilization of living organisms known to cause illness or death to insects as mean of biological control by e.g. using parasites, bacteria, virus, fungus or predators. For example:
  - 1. Nematode worms :
    - *Romanomermis culiciforax* (still in study phase)
    - *Romanomermis iyengari* – known to penetrate body of larva mosquito, and live as parasite inside the mosquito

4. Biological Control

- **The utilization of living organisms known to cause illness or death to insects as mean of biological control by e.g. using parasites, bacteria, virus, fungus or predators. For example:**

  - **2. Virus :**
    - ***Cytoplasmic polyhedrosis*** **control the larvae of butterflies**
  - **3. Fungi :**
    - ***Coelomomyces stegomyiae*** **infects *Culex*** mosquitoes

4. Biological Control

- **The utilization of living organisms known to cause illness or death to insects as mean of biological control by e.g. using parasites, bacteria, virus, fungus or predators. For example:**

1.

4. **Bacteria: against larvae of *Anopheles* and *Aedes***
   - ***Bacillus thuringiensis***
   - ***Bacillus sphaericus***

4. Biological Control

- **5. Arthropods :**
  - ***Arrenurus mandaraszi*** **(aquatic mites), ectoparasite attacking newly hatched adult mosquitoes**

- **6. Protozoa : parasite of mosquitoes**
  - ***Pleisthophora culicis***
  - ***Nosema algerae***

4. Biological Control

- **The utilization of living organisms known to cause illness or death to insects as mean of biological control by e.g. using parasites, bacteria, virus, fungus or predators. For example:**

  7. Predator fish feeding on mosquito larvae :

  - ***Panchac panchac*** **(Ind.:ikan kepala timah)**
  - ***Lebistus recticularis***
  - ***Gambusia affinis*** **(Ind.: ikan gabus)**
  - ***Betta splendens*** **(Siamese fighting fish, Ikan Cupang, Tempalo)**



Siamese fighting fish (Ikan Cupang Tempalo; *Betta splendens)*

4. Biological Control

- **Biological Prophylaxis** is another term used, meaning to redirect insect's attention to another target. By placing the cattle between the house and the mosquito breeding sites, man is prevented from mosquito bites.

4. Biological Control

- **Repellents** is a term used for plants or substances which prevent or to redirect insect's attention to another target. By using topical ointments on the skin, mosquito is prevented from biting.









TANAMAN

Usir Nyamuk dengan Tanaman

Ada berbagai cara untuk mengatasi nyamuk yang membandel, tapi inilah cara yang paling aman.

NYAMUK-NYAMUK yang mewabah saat musim hujan tiba memang bikin *sebel*. Segala cara dilakukan agar nyamuk tidak datang. Pakai obat nyamuk bakar, tak tahan dengan bau asapnya. Pakai obat nyamuk semprot, takut terkontaminasi oleh kandungan kimia yang ada di dalamnya. Lalu, pakai apa, *dong*?

Ada cara alami mencegah nyamuk singgah ke rumah, yakni dengan meletakkan tanaman tertentu. Tanaman zodia, lavender, dan geranium diyakini mampu mengusir nyamuk. Ketiga tanaman ini mengeluarkan aroma khas yang membuat nyamuk *ogah* mendekat. Selain indah, tanaman-tanaman ini aman bagi kesehatan karena tidak mengandung bahan-bahan kimia. Yuk, berkenalan satu-persatu dengan mereka.

1. Zodia (Evodia suaveolens scheff)

Tanaman zodia merupakan tanaman yang paling efektif mengusir nyamuk. Tanaman ini berasal dari Papua, dan sejak dulu digunakan oleh suku di sana sebagai tanaman obat.

Zodia termasuk tanaman yang menyenangi matahari, karena itu tanaman ini harus dikeluarkan dari ruangan setiap hari. Penyiramannya tidak usah terlalu sering, cukup 2 kali seminggu.

Zodia berukuran besar ini harganya cukup mahal, yaitu Rp 250.000. Sedangkan yang kecil seharga Rp 19.000.

2. Geranium (Pelargonium graveolens)

Geranium sebenarnya lebih cocok berada di udara dingin. Udara Jakarta masih memungkinkan tanaman ini hidup, namun daun-daunnya akan tumbuh kecil. Jika batangnya mulai memanjang dan daun mulai berkurang, geranium harus segera dipangkas. Daun pun akan tumbuh kembali. Berbeda dengan zodia, geranium harus sering disiram dan dipupuk terus menerus.

Dibanding zodia, harga geranium jauh lebih murah. Di Kuntum Nurseri (Bogor), tanaman ini dihargai Rp 9.500.

3. Lavender(*Lavandula spp*)

Aroma lavender tidak sekeras geranium dan zodia sehingga lebih efektif jika dioles ke badan. Lavender sangat membutuhkan matahari, sehingga harus diletakkan di tempat yang tidak ternaungi. Tempat teduh justru bisa menggugurkan bunganya.

Lavender harus diletakkan pada tempat yang mendapat sinar matahari penuh.

TIM TABLOID RUMAH

TAN RAHARDIAN

Ditaruh di mana?

Tanaman-tanaman anti nyamuk ini bisa diletakkan di dalam atau di luar ruangan. Yang paling tepat adalah menaruhnya di dekat jendela, pintu, ventilasi, dan tempat-tempat yang memungkinkan nyamuk masuk ke dalam rumah. Selain mencegah nyamuk masuk ke dalam rumah, hembusan angin bisa membuat aroma tanaman ini menyebar.

TIP

Jika tanaman sudah rimbun, sebaiknya tanaman tetap berada di luar. Petik saja beberapa lembar daun yang sudah tua, taruh di atas piring, dan letakkan di dalam ruangan. Daun di atas piring ini bisa tahan sampai dua bulan.

Rubrik ini hasil kerjasama KLASIKA dan tabloid RUMAH

In Indonesia anti-mosquito plants are on high demand

Some anti-mosquito plants:

1. *Kayuputih*
2. *Citronella*
3. *Geranium*
4. *Zodia*
5. *Lemongrass*
6. *Rosemary*
7. *Lavender*
8. *Sambiloto*

LOCAL HERBAL DRINKS

(Belived To Return The Thrombocyte Level Back To Normal)



- ۞Jus kurma
- ۞ Air kelapa muda dengan jeruk mipis
- ۞ Jus jambu biji (merah)
- ۞ Sambiloto, daun dewa
- ۞ Akar alang-alang, jeruk mipis



5. Genetic Manipulation

- Manipulation of insect genes using various methods for the purpose of replacing harmful insect population with harmless population e.g. by manipulating the reproductive ability. Most genetic manipulation of insects are still in the experimental stages.
  - Sterile Male Technique – using chemicals substance or radiation method (using Cobalt 60) to alter the DNA chromosome of the sperms. The sterile male produced will in turn produce another sterile generations.

5. Genetic Manipulation

- **Sterile Male Technique – using chemicals substance or radiation method (using Cobalt 60) to alter the DNA chromosome of the sperms. The sterile male produced will in turn produce another sterile generations.**
- **Radiation technique is used to alter the position, sequence and location of the chromosome gene producing generation incapable of acting as vector of disease (Chromosome Translocation)**
- **Inter-species cross breeding with the purpose of getting a hybrid male species incapable of fertilizing its females (Hybrid Sterility)**

Legislative Control

- Government issue legislations to prevent dangerous insect vector from crossing state borders or from one country to another, carried by commercial transporters (cars, airplanes, ships) *e.g.* quarantine regulations and monitoring in every airports and ship havens or state borders, requirement to fumigate all airplanes using insecticides, etc.

INSECTICIDE

Insecticide is divided based on:

1. **Stages of insects which are killed**
   - Imagoside, nympha, ovisida
2. **Kinds of insects are killed**
   - akarisida tungau, pedikulisida tuma
3. **How to enter the insect's body**
   - contact toxic
   - abdominal toxic
   - respiratory toxic

LARVISIDALS ARE ALSO POPULAR



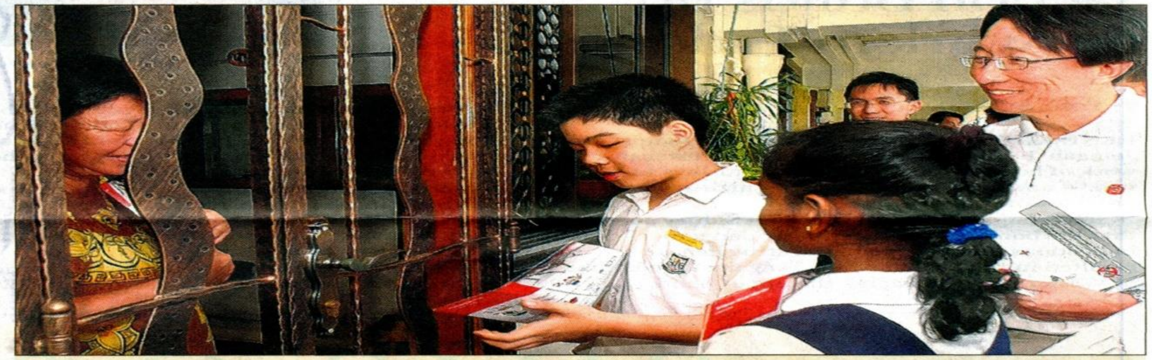
Think also of the local customs

- Singapore: Improvement of public utilities.
- Malaysia: Legislation.
- Indonesia: Government Authorities.

Door-to-door DENGUE BATTLE

Second hotline set up as volunteers comb hot spots for breeding sites

Serene Luo & Melissa Sim



THE ADVANTAGE of a door-to-door campaign is that you can explain in a language the residents understand, said Mr Lim (right) seen here visiting homes in Buona Vista with volunteer students.

PHOTO: SHAHRIYA YAHAYA

NO FLOWER pot is being left unturned in the search for dengue-carrying mosquitoes.

Seven hundred staff from the Singapore Soka Association and Singapore Civil Defence Force, among others, and volunteers combed parts of Hougang, Ang Mo Kio, Yishun and Marsiling — reported dengue hot spots — yesterday for possible mosquito-breeding sites.

Over at Holland Close and Woodlands Street 11, hundreds of grassroots leaders conducted house-to-house visits, giving out flyers detailing five steps to prevent mosquito-breeding.

The number of dengue fever cases spiked to a high of 144 cases by 3pm yesterday. There were 54 cases on Friday, and 122 on Thursday. Dengue fever has been spreading like wildfire all over Asia. In Singapore last week, 692 people came down with the illness, which causes high fever, vomiting, nausea and rashes.

More than 10,000 cases have been reported here this year and eight have died.

Destroying mosquito-breeding sites, through combing and identifying areas like at Hougang, is one of the primary tasks the inter-ministerial dengue committee will be doing.

Associate Professor Koo Tsai Kee, Senior Parliamentary Secretary (Environment and Water Resources), who was at the Hougang effort, said this "level of intensity cannot be sustained week after week".

"But in the short term, we hope to reduce the Aedes mosquitoes to a low level, so this is one of the ways."

At Holland Close, Mr Lim Swee Say, Minister (Prime Minister's Office) and Second Minister for National Development, said it was important to go beyond distributing flyers.

"Take Buona Vista. It's an old estate and many people speak dialects or the mother tongue," he said.

"When grassroots leaders go door-to-door, even if people are unable to understand the message printed on the flyer, we can spend a couple of minutes explaining to them in a language they understand."

To help non-English speakers, the National Environment Agency (NEA) added a second anti-dengue hotline number yesterday — 1800-333-7777.

The first, 1800-X-DENGUE, was launched last Tuesday. Some 1,000 calls have been logged each day, three times the usual number NEA gets on its general hotline.

Straits Times journalist Lydia Lim said in her column on Friday that the "use of an English word to help people remember an important telephone number may work just fine in countries like the United States but not here in Singapore, where many do not speak the language".

Mr Lim thought the second hotline was a good idea. "For those who understand English, they can just remember X-DENGUE. And for those who cannot spell it, there is the new number which is much easier to remember."

Foodcourt stallholder John Lee, 49, who says his Chinese is better than his broken English, thought the second hotline number would be more popular than the first.

"When you want to make a report, you don't want to struggle with a complicated number," he said in Mandarin.

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Update

- No. of dengue cases reported for Sept 17: **144**
- No. of dengue cases admitted to public hospitals on Sept 16: **90**
- No. of beds taken up by dengue cases on Sept 16: **341**
- **Prevention tip:** Do not block the flow of water in scupper drains along common corridors in HDB estates. Avoid placing potted plants and other paraphernalia over scupper drains and do not sweep litter into gully traps.

In S'pore students and volunteers made house calls

IN SUMMARY

- Insects remains a problem for times to come
- Transmission of vector borne diseases knows no country borders
- Local beliefs and wisdom of avoiding insect bites and improving health defense should be observed.





Sekian ....

Thank you

Thank you